Visual rehabilitation with an IOL is an ideal option in aphakic eyes. In some cases, supplementary IOL implantation in the ciliary sulcus is a viable option; in others, the capsulorrhexis remnants are not sufficient to securely support an IOL. The use of an anterior chamber IOL has also been described, but so have the long-term complications associated with these lenses, especially in eyes with shallow anterior chambers.

Another alternative is transcleral fixation of an IOL. This technique has gained popularity over the past 2 decades, most likely due to improvements in lens designs and implantation techniques.

One technique to fixate a posterior chamber IOL in the absence of sufficient capsular support is transcleral suturing. It can be used in primary and secondary IOL implantation procedures and also to refixate a malpositioned lens. There are numerous surgical approaches for fixation of an IOL to the scleral wall adjacent to the ciliary sulcus or pars plana, as well as for securing the lens to iris tissue. These techniques enable surgeons to achieve safe and stable fixation of posterior chamber IOLs in high-risk cases, avoiding the complications of anterior chamber IOLs.

In pediatric aphakia, implantation of a scleral-fixated posterior chamber IOL is preferable to an anterior chamber IOL because of long-term complications associated with the latter, namely corneal decompensation, glaucoma, and pupillary ectopia. As with all treatment options for pediatric aphakia, however, posterior chamber IOL implantation can be associated with problems. Suture failure, especially in the long term, can result in lens decentration or subluxation.

Malbran et al first reported transscleral sulcus fixation of posterior chamber IOLs after intracapsular cataract extraction (ICCE) in aphakic eyes in 1986. Although most posterior chamber IOLs can be sutured by their haptics to the sclera with square knots or slipknots, several specialized haptic designs facilitate this maneuver. These include haptics with enlarged ends to avoid suture slippage.

**Surgical Technique**

**Background.** Ideally, an IOL sutured to the sclera should not make contact with the overlying iris. Suturing the haptics to the sclera eliminates the risk of pseudophacodonesis commonly associated with IOLs sutured to the iris. Transsclerally sutured IOLs can be implanted with an open-sky or a limbal approach; both require expertise and more time than routine IOL implantation.

**Vitrectomy.** Thorough vitrectomy with dedicated vitrectomy instruments is required at the beginning of surgery in order to avoid vitreous-IOL contact and subsequent inflammation-related problems. Additionally, the anterior vitreous skirt must be cleaned before IOL implantation.

**Transscleral sutures.** Malbran et al described the use of ab externo suture techniques to guide the sutures through the sclera and achieve sulcus fixation. However, there has been a shift toward ad externo techniques in order to improve the accuracy of needle placement. Some studies have shown that the ab externo approach results in more precise positioning of the IOL. A direct comparison of the techniques showed that ab externo suturing is associated with better visual acuity and fewer complications including astigmatism, cystoid macular edema, pupil distortion, suture exposure, and IOL decentration.

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**Take-Home Message**

- A transscleral suturing technique can be used to fixate a posterior chamber IOL in the absence of sufficient capsular support in primary and secondary IOL implantation procedures or to refixate a malpositioned lens.
- Suturing the haptics to the sclera eliminates the risk of pseudophacodonesis commonly associated with IOLs sutured to the iris.
- To achieve suture coverage, the IOL haptics can be fixed to the sclera at two points using a continuous-loop suture placed through the eyelets of the haptics, with the knot rotated into the sclera.
Generally, 10-0 polypropylene is the suture material of choice for transscleral fixation of posterior chamber IOLs. Owing to recent concerns regarding durability, however, the use of 9-0 polypropylene and other suture materials such as polytetrafluoroethylene (Gore-Tex; W.L. Gore & Associates) has increased; 9-0 polypropylene sutures may potentially reduce suture-related complications due to their larger cross-sectional diameter and greater tensile strength compared with 10-0 polypropylene. However, increased suture diameter may require larger bore sclerostomies with the potential for increased risk of leakage. The thicker suture is also more difficult to rotate and bury; an unburied suture can lead to erosion through the conjunctiva.

**Suture coverage.** Coverage of suture knots with conjunctiva or a partial-thickness scleral flap has been associated with high suture exposure rates (5%–50% and 14.7%–17.9%, respectively). As an alternative, the IOL haptics can be fixated to the sclera at two points using a continuous-loop suture placed through the eyelets of the haptics. With this technique, the knot can be rotated into the sclera to avoid knot exposure. Reported exposure rates with this technique range from 0% to 6.7% after 8 to 24 months.

**OUTCOMES AND COMPLICATIONS**

**Outcomes.** Scleral fixation generally has favorable outcomes in the absence of associated ocular pathologies such as cystoid macular edema and secondary glaucoma. Kwong et al reported no statistically significant differences in the complication profiles of primary IOL implantation in the anterior chamber and primary scleral fixation of IOLs.

In a recently published case series of 104 eyes that underwent scleral-fixation surgery, Luk et al reported that 72% of patients had unchanged or improved final postoperative visual acuity (mean follow-up, 73.4 ± 43 months). However, 24% had postoperative complications, of which 12.5% required a further procedure to address the complication. Suture-related complications were the most common.

**Suture-related problems.** Erosion of suture knots through the conjunctiva creates a communication between the intra- and extraocular environments with attendant risks of toxic or microbial contamination. Initially, fixating sutures were tied under the conjunctiva alone; however, up to 24% of cases experienced contamination. Once surgeons started to cover the sutures with scleral flaps, the rate of erosion decreased to 15%. Epstein described a series of 22 patients in whom ICCE was performed with implantation of a scleral-sutured IOL.

Lens stability may be established independent of suture integrity if the haptics become encased in fibrous tissue, but this phenomenon cannot be relied upon. Lubniewski et al concluded that the integrity of the suture, rather than fibrous encapsulation, contributes to lens stability. IOL
dislocation as a result of suture loosening or rupture has also been reported, and dislocation can occur if there is internal cheese-wiring of the suture, even without disintegration of the polypropylene or disruption of knot integrity. Therefore, removal of the suture if it becomes exposed is not a safe option. Better ways to address this problem include trimming or cautery of the knot and surgical coverage with a corneal or scleral patch graft.

In a retrospective series of 30 eyes with 23 months’ follow-up, Solomon et al19 reported an incidence of suture-related problems in 73% of eyes. Likewise, Uthoff et al18 reported an incidence of complications of 17.9% in 624 patients after 1 year, and Luk et al21 reported suture breakage in 1.9% in 73 months.

Lens tilt and decentration. Without the support of the lens capsule, there is greater potential for a posterior chamber IOL to tilt around the points at which it is sutured or to become decentered. Significant lens tilt (more than 10°) occurs in 11.4% to 16.7% of patients after two-point scleral fixation of posterior chamber IOLs. Techniques that fixate the IOL at two points on one or both haptics may reduce this complication.

Cystoid macular edema. This is the most commonly noted complication after scleral fixation of a posterior chamber IOL, and most cases are associated with vitreous loss. Light-induced retinal injury may also be a contributory factor.

Hyphema and vitreous hemorrhage. Suturing of posterior chamber IOLs requires needle passes through vascular uveal tissue. In many cases, associated bleeding is minor and resolves spontaneously. Keeping the suture anterior (1 mm behind the surgical limbus) and avoiding the 3- and 9-o’clock positions are two strategies to eliminate bleeding. In some instances, this complication may lead to ghost cell glaucoma.

FUTURE PERSPECTIVES

Sutureless scleral-fixated IOL implantation with intra-scleral haptic fixation and gluing of the IOL has been gaining recognition in recent years. Scharioth et al23 reported good intermediate results of sutureless surgery, with no cases of recurrent dislocation or retinal detachment at a median follow-up of 7 months. In the glued-sutureless technique described by Agarwal et al,24 surgical fibrin glue sealant is used to secure the scleral flap and the externalized haptic to the scleral bed. The technique avoids the complexity of suturing and may reduce complications such as pseudophacodonesis, persistent iris rubbing, and needle damage to the ciliary body. It has been shown to be at least as effective as a sutured IOL technique.25 In one series, IOL centration outcomes at 1 year were good, with no major complications including retinal detachment or endophthalmitis.26

Overall, the visual prognosis and surgical outcomes of scleral-fixated IOL surgeries has become better in the past few years due to advances in surgical techniques. Careful patient selection, preoperative evaluation, and prognostication of cases are mandatory for optimal outcomes. ■

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